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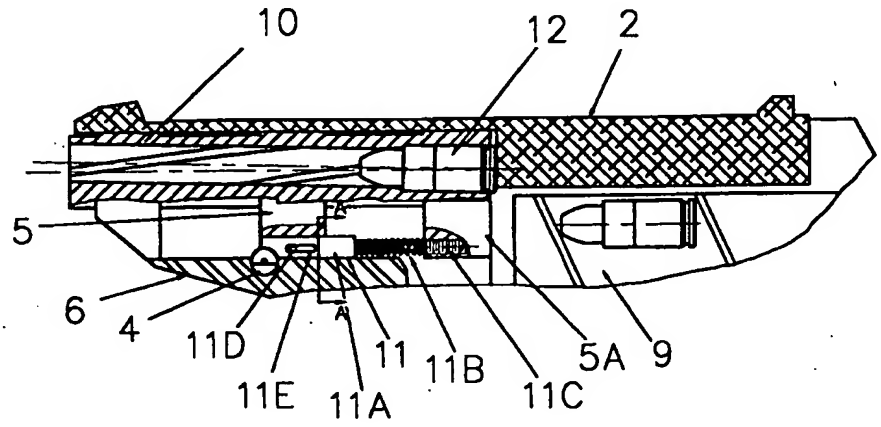
(54) Title: BARREL POSITIONING MECHANISM FOR AUTOMATIC FIREARMS



(57) Abstract

A training barrel for a normally breech-locked, blow-back operated firearm omits the breech-locked function and replaces it with a barrel positioning device attached to the barrel. A spring provides the force to displace the barrel rearwardly to properly position it to receive the next cartridge being loaded.

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Title: BARREL POSITIONING MECHANISM FOR AUTOMATIC FIREARMS

Field of the Invention

This invention relates to the field of firearms and provisions for modifying semi-automatic firearms for training purposes. In particular, it relates to the positioning of barrels to ensure reliable chambering in blow-back firearms that have been modified to fire low-energy ammunition.

Background to the Invention

In military and police firearms applications almost all of the ammunition consumed is used in training. For some training purposes, however, normal ammunition is not adequate. An alternative type of known training ammunition represented by United States Patent Nº 5,359,937 fires a low-mass projectile relying on a special low-energy cartridge designed to provide cycling of suitably-modified, recoil-operated automatic weapons.

An advantage of the low-energy training ammunition is that it has a shorter range and lower penetration capacity than standard ammunition. This permits use of smaller, less secure firing ranges as training facilities. If standard ammunition were accidentally employed in these facilities, unexpected dangers would arise from the increased striking power and range of standard ammunition.

The weapon modifications required to permit cycling while firing low-energy training ammunition generally include replacing or modifying the barrel and sometimes replacing or adding one or two other components, depending on the weapon involved. These modifications also serve to increase safety. For Example, in 9 mm automatic firearms, the caliber of the substitute barrel may be made smaller than the diameter of the projectiles of standard 9 mm ammunition. Then, if an attempt is made to chamber a standard round in such a training-adapted firearm, the barrel will not normally admit entry of the standard projectile. This ensures that such modified weapons cannot fire standard, live ammunition.

The low-energy cartridge represented by United States Patent Nº 5,359,937, in combination with a substitute training barrel, allows normal recoil and cartridge case ejection through a blow-back action.

When firing standard ammunition, with its abundant associated energy, it is necessary in many weapons, particularly hand guns, to lock the barrel to the slide during the beginning of their rearward motion for a period long enough for the projectile to exit the barrel muzzle while the breech is still closed. This allows the chamber pressure to drop before the breech opens to eject the spent cartridge case. A locking mechanism couples the slide and barrel together for the first portion of the recoil, and then

releases the slide. Upon the unlocking of the barrel from the slide, the slide continues its rearward travel while the barrel stops in the proper position to receive the next round from the magazine to be chambered.

In a training barrel it is necessary to omit this breach-lock mechanism. This is because there is not sufficient energy in such low-energy, training cartridges to precipitate sufficient recoil to unlock the barrel and the slide in their standard configurations. A training barrel of the type addressed by the invention is similar in most aspects to the standard barrel for a particular breech-locked pistol but is modified, in part, by removing the locking mechanism that holds the barrel and slide together for the first portion of the recoil cycle.

In some 9 mm pistols, however, after the barrel-slide locking mechanism has been removed so that the weapon can fire low-energy ammunition as represented by United States Patent Nº 5,359,937, the barrel does not move rearward far enough after firing to be in its proper position to receive the next round to be chambered. This happens precisely because the barrel is no longer locked to the slide, which would normally carry the barrel to the correct position before unlocking and leaving it there.

It is therefore an object of the invention to provide a conversion barrel system for this class of firearm

that will ensure the proper positioning of the barrel for reloading.

Prior art as represented by United States patents 4,907,489 (Teague) and 5,433,134 (Leiter) is related to the cycling of automatic pistols adapted to fire blank ammunition. In both instances the problem of unlocking the slide and barrel is recognized as being appropriate to obtain proper cycling of the slide and solutions for locating the barrel are described. Those solutions are not, however, the only ones that are possible. This invention addresses a further means by which this operation may be carried-out.

The invention in its general form will first be described, and then its implementation in terms of specific embodiments will be detailed with reference to the drawings following hereafter. These embodiments are intended to demonstrate the principal of the invention and the manner of its implementation. The invention in its broadest and more specific forms will be further described, and defined, in each of the individual claims which conclude the specification.

Summary of the Invention

This invention is directed to an automatic pistol adapted to fire low-energy training ammunition by the substitution of a training barrel that omits the breech-lock feature normally present. It provides a system for the

positioning of the barrel for reloading by adding a spring-loaded device to the bottom of the training barrel which, upon firing, positively moves the barrel rearward to its required position for receiving the next cartridge from the magazine in a manner which is completely independent from the motion of the slide. Without this barrel positioning mechanism, the barrel would be too far forward from the top of the magazine and the incoming cartridge would not necessarily enter the chamber cleanly, hence provoking a weapon jam whenever such misalignment should occur.

According to the invention, a firearm is provided with a slide and a barrel which at no time are locked together during the firing cycle. The barrel is provided with a spring-loaded positioning bar which serves as a barrel positioning device. This positioning bar with its associated spring is mounted on the barrel, allowing free longitudinal movement between the bar and the barrel. Conveniently, some barrel designs include protrusions in the form of spaced lugs on the barrel, and the positioning bar and spring may be carried by two of the barrel lugs. Collectively, the positioning bar and spring with other parts to be described constitute a resilient barrel positioning mechanism.

The positioning bar abuts at its forward end the barrel locking pin or some other suitable anchor point in the frame of the weapon. When the weapon is ready to fire, the

barrel positioning spring is at maximum compression because the slide has pushed the barrel to its farthest forward position during chambering of the low-energy cartridge to be fired. When firing occurs, the slide recoils without pulling the barrel back with it. Even though there is nothing obstructing rearward movement of the barrel, because the two pieces (slide and barrel) are not locked together, the barrel would normally not move rearwardly without the barrel positioning mechanism of the invention being present. Rearward motion of the barrel is effected by the barrel positioning mechanism as it bears on the barrel locking pin, its spring force being expressed in the rearward direction.

One way of attaching the barrel positioning mechanism to the barrel is by providing a seating pin at the forward face of the rear lug of the barrel and seating one end of the barrel positioning spring over the seating pin. The other end of the positioning spring is attached to the positioning bar. A groove in the adjacent, forward barrel lug receives and embraces the positioning bar. On firing, the forward barrel lug will move longitudinally over the positioning bar, which is held in the groove by a lateral pin which passes through an elongated slot in the bar and is fixed to the forward lug.

The travel of the barrel is delimited by this pin-and-slot arrangement in the positioning bar, which ensures,

through the length of the slot and the location of the lateral pin relative to the back face of the barrel, that the barrel is in the correct position to receive the next round to be chambered when the slide returns to close the breech.

Of particular note, the subject training barrel, after being properly positioned rearwardly by the barrel positioning device, does not need to be continually held in place during the entire chambering of the next cartridge to be fired. In fact, the barrel may commence to move forward as soon as the tip of the projectile begins to enter the chamber. This forward movement may occur because the spring in the barrel positioning device is extended after pushing the barrel rearward and presents no appreciable resistance to forward barrel movement under the influence of the returning slide. This is in contrast to the prior art design of Leiter, which describes a much stronger detent mechanism to hold the barrel in place "until a cartridge has been successfully chambered".

The barrel positioning spring must be of sufficient length and strength that it will be held in compression by the force of the spring or springs driving the slide, when the barrel is in its forward position prior to firing. The mechanical characteristics of the barrel positioning spring in compression must be such that this spring will be capable of readily lengthening from its compressed state to move the barrel positively back to the required position for receiving

the next round, as determined by the pin and slot arrangement after the slide recoils. The barrel positioning spring remains only partially expanded after rearward movement of the barrel ceases so that the barrel will not move forward again until the slide of the weapon commences to chamber the next cartridge.

The strength of the spring in the barrel positioning device is much less than the strength of the spring or springs associated with the slide so that the motion of the slide will not be impeded as it returns to close the breech and push the barrel forward in preparation for firing of the next cartridge. In doing so, this action of the slide recompresses the barrel positioning spring, readying it for the next cycle.

The foregoing summarizes the principal features of the invention and one of its optional aspects. The invention may be further understood by the description of the preferred embodiments, in conjunction with the drawings, which now follow.

Summary of the Figures

Figure 1 is a partially cutaway, cross-sectional side-view of a prior art pistol ready to fire standard 9mm ammunition (only the barrel, slide, locking mechanism, part of the frame and part of the magazine are shown).

Figure 2 is the same side-view cross-section of the same pistol as in Figure 1 except that it now contains a training barrel, complete with the barrel positioning mechanism, and is ready to fire low-energy ammunition as represented by United States Patent Nº 5,359,937. The spring in the barrel positioning device is at maximum compression.

Figure 3 is a partial cross-section through a barrel lug and the pistol frame of the pistol of Figure 2.

Figure 4 shows the pistol of Figure 2 after firing with the slide in its most rearward position, ready to be moved forward by the slide recoil spring or springs (not shown). The spent case from the cartridge of Figure 2 after firing has been ejected from the weapon and the next cartridge from the magazine is in position to be chambered by the returning slide.

Description of the Preferred Embodiment

In Figure 1 a prior art 9 mm pistol is shown having a barrel 1 with lugs 5, 5A, slide 2, a normal barrel-slide locking mechanism 3 with piston 7, frame 6 with barrel locking pin 4 and magazine 9, and standard 9 mm service ammunition 8. When this pistol is converted to fire low-energy ammunition as represented by United States Patent Nº 5,359,937, barrel 1 is replaced by training barrel 10, as shown in Figure 2.

Training barrel 10 differs from prior art barrel 1 in that the barrel-slide locking mechanism 3 with piston 7 is replaced by barrel positioning mechanism 11 consisting of barrel positioning bar 11A with slot 11E, spring 11B, spring seating pin 11C, and transverse pin 11D. Although the preferred cross-section of the barrel positioning bar 11A is rectangular, it could also be circular or some other shape. The rearward end of spring 11B is mounted on seating pin 11C, which is attached to lug 5A, pointing forwardly. The other, forward end of positioning spring 11B is attached to positioning bar 11A, around which grove 13 in lug 5 is free to move longitudinally and parallel to the barrel. The forward end of positioning bar 11A abuts against barrel locking pin 4 on the frame 6, thereby immobilizing positioning bar 11A with respect to the frame 6 during the firing cycle. This forward end may be curved to mate intimately with the surface of the barrel locking pin 4.

Positioning bar 11A is held in groove 13 by transverse pin 11D in slot 11E. Pin 11D is anchored in lug 5, hence both move with the same motion as the training barrel 10. The location of pin 11D and the length and location of slot 11E are such that the stroke of pin 11D is sufficient to allow movement of training barrel 10 rearward, after firing of the weapon, to its proper position for chambering of the next cartridge to be fired.

Rearward movement of training barrel 10 from its forward position at the moment of firing is effected by positioning spring 11B, which is in compression at the time of firing. Since positioning bar 11A does not move because it is abutted against barrel locking pin 4, positioning spring 11B is constrained to expand rearward only. As soon as the slide 2 begins to move rearward, thereby leaving training barrel 10 unfettered and presenting no impediment to barrel motion because the two components are not locked together, the rearward-directed force provided by compressed positioning spring 11B pushes training barrel 10 rearwardly until brought to a stop at the desired position by transverse pin 11D arriving at the rearward end of slot 11.

The forward motion of slide 2, which chambers low-energy cartridge 12, then picks up training barrel 10 in the normal manner of the firing cycle and moves it forward to the battery position ready for firing of the next round. This compresses spring 11B and readies the barrel positioning device for the next cycle, as shown in Figure 2.

The functioning of the subject barrel positioning device has been tested many hundreds of times in Walther P-5 pistols with complete success and reliability. The barrel positioning device of the invention is particularly suited for training barrels for such 9 mm automatic pistols as the Walther P-5, Walther P-38, Beretta 92 and Beretta 96, but may

also be applicable to other automatic firearms that fire low-energy ammunition as represented by United States Patent Nº 5,359,937 or other type of low-energy ammunition, including blanks.

Conclusion

The foregoing constitutes a description of specific embodiments showing how the invention may be applied and put into use. These embodiments are only exemplary. The invention in its broadest and more specific aspects is further described and defined in the claims which now follow.

These claims, and the language used therein, are to be understood in terms of the variants of the invention which have been described. They are not to be restricted to such variants, but are to be read as covering the full scope of the invention as is implicit within the invention and the disclosure that has been provided herein.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A training barrel for an automatic fire arm comprising:

(1) a barrel with a central axis;

(2) a first, seating protrusion extending from the barrel to provide a seat for a positioning spring;

(3) a second, grooved, guide protrusion extending from the barrel to support and guide a barrel positioning bar;

(4) a barrel positioning bar mounted within and aligned with the groove in the guide protrusion so that such protrusion may slide over the barrel positioning bar and permit the barrel to move rearwardly with respect to the positioning bar;

(5) a barrel positioning spring seated at its rearward end on the seating protrusion and connected at its forward end to the barrel positioning bar to thrust the seating protrusion away from the positioning bar; and

(6) a travel limiting means to limit the travel of the guide protrusion with respect to the positioning bar,

whereby the barrel is limited to sliding displacement with respect to the positioning bar in a direction that is parallel to the axis of the barrel.

2. A training barrel as in claim 1 wherein the travel limiting means comprises a longitudinal slot formed in the positioning bar and pierced by a transverse pin fixed at its ends to the second guide protrusion.

3. The training barrel of claim 1 in combination with a weapon having a slide that is free to move rearwardly with respect to the barrel and wherein the barrel is free within the weapon to move rearwardly upon firing.

4. The training barrel of claim 2 in combination with a weapon having a slide that is free to move rearwardly with respect to the barrel and wherein the barrel is free within the weapon to move rearwardly upon firing.

5. A firearm comprising:

(1) a frame;

(2) a barrel with a central axis mounted on the frame so that the barrel may be slidingly displaced with respect to the frame in the direction of the central axis;

(3) a slide mounted on the frame free for sliding displacement, independent of the barrel, in the direction of the central axis from a battery position when the slide bears against the barrel;

(4) resilient means urging the slide forwardly, towards the battery position;

(5) resilient means positioned between the frame and the barrel to urge the barrel rearwardly when the slide is displaced rearwardly from the battery position.

6. A firearm as in claim 5 further comprising travel limiting means to limit the rearward travel of the barrel with respect to the frame.

7. A firearm as in claim 5 further comprising a barrel positioning spring and barrel positioning bar coupled to the barrel, the positioning spring being seated at its rearward

end on the barrel and bearing at its forward end on the rearward end of the positioning bar, the forward end of the positioning bar being in contact with the weapon frame whereby the barrel is biased for rearward displacement with respect to the frame.

8. A firearm as in claim 7 further comprising travel limiting means to limit the displacement of the barrel with respect to the frame, such travel limiting means comprising a slot formed in the barrel positioning bar and a transverse pin passing therethrough, the transverse pin being fixed with respect to the barrel.

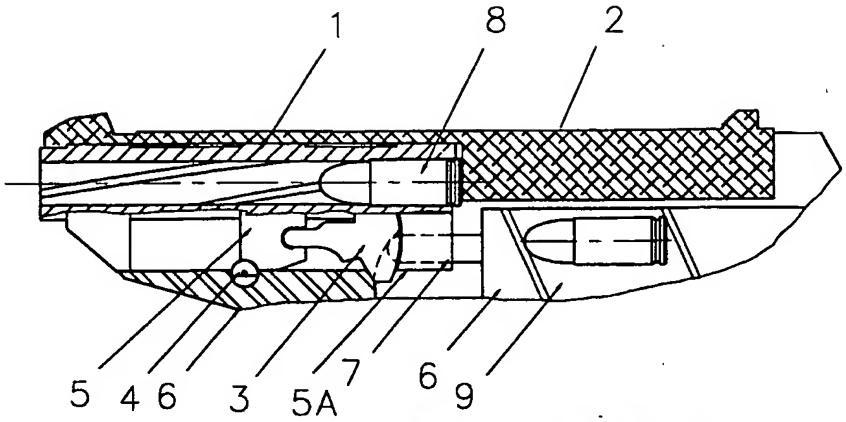

FIGURE 1

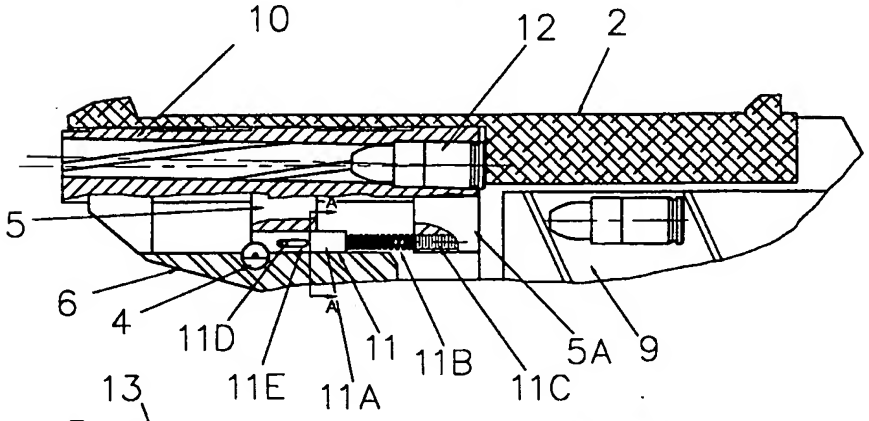

FIGURE 2

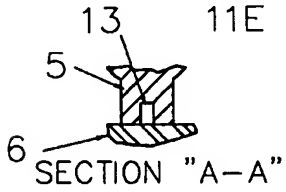

FIGURE 3

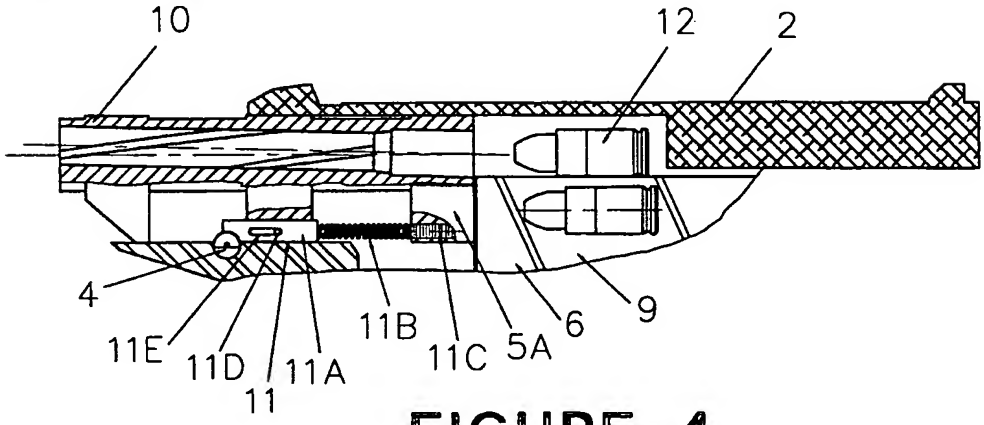

FIGURE 4

INTERNATIONAL SEARCH REPORT

Int. .tional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F41A33/00 F41A5/34

According to International Patent Classification(IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F41A

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 505 917 A (HECKLER & KOCH GMBH) 30 September 1992 see column 6, line 42 - column 12, line 58; figures ---	1,5
A	DE 43 41 131 C (HECKLER & KOCH GMBH) 2 February 1995 see column 4, line 33 - column 9, line 29; figures ---	1,5
A	US 5 433 134 A (LEITER) 18 July 1995 cited in the application see column 4, line 34 - column 9, line 36; figures --- -/--	1,5

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[X] Patent family members are listed in annex.

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Date of the actual completion of theinternational search	Date of mailing of the international search report
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 907 489 A (TEAGUE) 13 March 1990 cited in the application see column 3, line 43 - column 4, line 68; figures -----	1,5

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Information on patent family members

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